Hill's Evidence-Based Clinical Nutrition

HILL'S PRESCRIPTION DIET Canine & Feline Weight Management Nutrition Publications

CANINE PUBLICATIONS

EFFECTIVENESS OF A NEW DIETETIC FOOD TO ACHIEVE WEIGHT LOSS AND TO IMPROVE MOBILITY IN CLIENT-OWNED OBESE DOGS WITH OSTEOARTHRITIS

Christmann U, Becvarova I, Werre S, Meyer H. *Intern J Appl Res Vet Med* 2017;31:237.
Link to article

Summary:

- 89% of the overweight and obese dogs (n=34) fed with Hill's Prescription Diet Metabolic+Mobility Canine dry lost weight over 6 months with an average weekly weight-loss rate of 0.5% of starting body weight.
- Body condition score (BCS) and body fat index (BFI) decreased significantly over time compared to baseline.
- Owners perceived a significant improvement in rising and playing starting at month 2 of the study and in walking and activity level starting at month 3 of the study.
- Similarly, veterinarians' assessments revealed a significant improvement in lameness, weight bearing, and pain on palpation starting in month 3 of the study.
- In conclusion, owners and veterinarians reported significant improvements in dog's weight and mobility without negative side effects.

EFFECTIVENESS OF A NEW WEIGHT MANAGEMENT FOOD TO ACHIEVE WEIGHT LOSS AND MAINTENANCE IN CLIENT-OWNED OBESE DOGS

Christmann U, Becvarova I, Werre S, Meyer H. *Intern J Appl Res Vet Med* 2015;13(2):104–116.
Link to article

Summary

- 94% of dogs (n=153) fed Hill's Prescription Diet Metabolic lost weight with an average weight loss of 14.5% over 6 months and an average weekly weight-loss rate of 0.73%.
- BCS and BFI decreased significantly over time compared to baseline.
- 55% of dogs ate more Hill's Prescription Diet Metabolic than the recommended daily energy requirement (DER) for weight loss and 94% of dogs still lost weight.

- Owners perceived a significant increase in energy and happiness in the dogs after weight loss without changes in appetite or begging behavior, and significant improvements in dog's quality of life.

EFFECT OF FEEDING A WEIGHT LOSS FOOD BEYOND A CALORIC RESTRICTION PERIOD ON BODY COMPOSITION AND RESISTANCE TO WEIGHT GAIN IN DOGS

Floerchinger AM, Jackson MI, Jewell DE *et al. J Am Vet Med Assoc* 2015;247:375–384.
Link to PubMed

A REDUCED CALORIE, HIGH-FIBRE FOOD WITH ADDED COCONUT OIL, L-CARNITINE, LIPOIC ACID, LYSINE, AND LEUCINE INCREASES BASAL METABOLIC RATE IN OVERWEIGHT AND OBESE DOGS

Jewell D, Floerchinger A, Jackson M *et al. J Vet Intern Med* 2014;28(3):1087–1088(NM-9).

Abstract
Obesity is an increasingly common health concern that is frequently linked to other serious diseases in dogs. The purpose of this study was to determine the weight loss and weight maintenance benefits of a reduced calorie, high fiber test food with added coconut oil, L-carnitine, lipoic acid, lysine, and leucine designed to support fat metabolizing pathways in overweight or obese dogs.

The protocol was approved by an IACUC and participating dogs were group housed for social interaction in spacious rooms with natural light. The treatment group was composed of 20 dogs with a body condition score of 4 or 5/5 and >30% body fat as determined by DEXA. This group was compared to the colony average (n=341) and a colony derived subset of 20 adiposity matched controls. The treatment group was fed to achieve 1-2% body weight loss per week for 4 months, or until they achieved 15-25% body fat, followed by 4 months feeding to maintain body weight (BW) whereas; the colony was fed a variety of foods for maintenance throughout. DEXA scan data was available for all dogs (n=361). In addition, Test food fed dogs were weighed weekly and DEXA scanned monthly. Ideal body weights (IBW) were calculated from baseline DEXA as 1.25*lean body mass. Energy intakes were also recorded throughout and Caloric Intake/kg IBW was compared between groups. All study foods met minimum AAFCO requirements for adults.

All twenty dogs consuming the Test diet completed the study without complications. The dogs averaged a total weight loss rate of approximately 1.4% BW per week during the weight loss phase. After 4 months of maintenance feeding, DEXA revealed that the Test group had a mean percent body fat of 23.0 ± 1.6%. Compared to the beginning of the weight maintenance phase, mean lean body mass increased by about 2.6% (248 ± 112g, $p = 0.04$), mean body fat mass decreased by about 13% (474 ± 199g, $p \leq 0.03$), and mean body weight decreased by about 2% but this was not significant. The treatment group consumed significantly fewer calories than the other groups during months 1-5 ($p \leq 0.01$) and significantly more calories during months 7 ($p \leq 0.01$) and 8 ($p \leq 0.01$). Interestingly, despite losing fat mass, the Test food fed dogs consumed 16% and 25% more calories/kg IBW compared to the colony and adiposity matched control groups in month 7 and 24% and 33.7% more in month 8 respectively.

Results support that the food in this study led to successful weight loss and maintenance. Body condition improved through loss of fat and gain of lean muscle during maintenance feeding. Finally, metabolic rate appeared to increase over time as evidenced by preservation of body weight despite increased caloric intake compared to a large control group.

LEAN BODY MASS INCREASES, BODY FAT DECREASES DURING WEIGHT MAINTENANCE FOLLOWING WEIGHT LOSS IN OBESE DOGS

MacLeay JM, Hahn K, Melendez L. *J Vet Intern Med* 2013;27(3):743(NM-6).

Abstract
The objective of this study was to document the changes in body composition of overweight/obese dogs fed a new food moderate in calories, fat and protein, designed for weight loss and weight maintenance.

Twenty beagle dogs were determined to be at least 20% over their individual calculated ideal body weight as determined by dual x-ray absorptiometry (DXA). During the weight loss phase of the study, dogs were offered a once daily ration of the test food based on each individual's energy requirements set to achieve weight loss of 1-2% body weight/week. Dogs were placed on the weight maintenance protocol once they achieved target body weight (15-20% of their body composition as fat) or at the end of 4 months. The weight maintenance phase lasted an additional 4 months. Food offerings were adjusted as needed to maintain the body weight achieved at the end of the weight loss period. Monthly DXA was performed to determine body composition changes during weight loss and weight maintenance. Changes in body weight, percent body fat and lean mass at each time point were compared to baseline (month 0 for weight loss phase and month 4 for weight maintenance phase) using a paired t-test.

During the weight loss phase, average body weight decreased from 17.6 ± 0.71 to 13.6 ± 0.52 kg ($P < 0.01$). Average percent body fat decreased from 41.0 ± 1.01 to 26.0 ± 1.5 ($P < 0.01$). Lean body mass decreased from 9.82 ± 0.33 to 9.53 ± 0.30 kg ($P = 0.04$). During the weight maintenance phase, average total body weight decreased slightly from 13.6 ± 0.52 to 13.4 ± 0.50 kg; this change was not significant. Average percent body fat decreased from 26.0 ± 1.5 to 23.0 ± 1.6 ($P = 0.03$). Average lean body mass increased from 9.53 ± 0.30 to 9.78 ± 0.35 kg ($P = 0.04$). Serum biochemical values remained normal during weight loss and maintenance.

Based on this data, the test food provided safe and effective weight loss and maintenance. Lean body mass increased during the weight maintenance phase in the face of continued loss of body fat.

A HIGH FIBER FOOD IMPROVED WEIGHT LOSS COMPARED TO A HIGH-PROTEIN, HIGH-FAT FOOD IN PET DOGS IN A HOME SETTING

Fritsch D, Ahle NW, Jewell DE et al. *Intern J Appl Res Vet Med* 2010;8(3):138-145.
Link to article

Summary
The purpose of this prospective, randomized, multi-center clinical study was to evaluate the effectiveness of Prescription Diet r/d Canine pet food versus a higher-protein, higher-fat, lower-fiber food fed in equal caloric amounts in helping overweight and obese dogs lose weight. The tested foods were appropriate for adult dogs and available in dry and wet forms.

Investigators from 12 private veterinary practices located in the United States were involved in the study, which was conducted from September 2004 through March 2005. A total of 62 dogs completed the study. Ideal body weight was estimated by calculating fat-free body mass from dual x-ray absorptiometry (DEXA) analysis and adding 20% fat to this total. The most common breeds involved in the study were Labrador retriever and Labrador retriever mix.

In the final month of the 6-month study, owners feeding Prescription Diet r/d Canine formula reported a significant increase in quality of life compared to "no change" for the test food group. Pet owners feeding Prescription Diet r/d Canine formula noticed a greater improvement in coat condition compared to the test

group. Enthusiasm when eating was high for both groups. The pet's liking the food perception by the owners, stool appearance and volume were comparable for both foods by the end of the study. Pet owners feeding Prescription Diet r/d Canine formula also reported that their dogs were not as hungry during the first 8 weeks of the study.

Veterinarian assessment of average weight loss at the end of the study showed that dogs fed Prescription Diet r/d Canine lost significantly more weight than the group on the test food regardless of body condition score. Similar results were found based on percent of body weight lost, with the Prescription Diet r/d Canine group losing a significantly higher percentage of weight versus the group on the test food, regardless of initial body condition score.

EFFECT OF TOTAL DIETARY FIBER ON SATIETY IN DOGS

Yamka R, Friesen K. *The FASEB Journal* 2008 22:1_supplement, 1117.3-1117.3.
Link to article

Abstract
The objective of this study was to investigate the effects of feeding two foods with elevated levels of total dietary fiber on satiety in dogs. Both foods were formulated to contain similar levels of total dietary fiber (TDF; > 25% dry matter basis). The foods were fed to two groups of 10 beagles (average age = 4.64 ± 2.79 years; average weight = 14.0 ± 2.2 kg) for a period of 16 weeks in order to determine the effect of total dietary fiber on satiety. During the study dogs were given ad libitum access to the foods for a period of 45 minutes. Food intake was recorded daily and body weight was recorded weekly to determine the effects of fiber on satiety and weight maintenance. During the 16 week study, body weight decreased (1.4 kg on average; P <0.01) on both treatments while intake increased (82 g on average; P <0.01). There were no differences between the two treatments for intake or body weight at week 1 or 16 indicating that the level of TDF in the food was efficacious in promoting satiety in beagles. Interestingly, dogs only lost weight during weeks 1 to 4 and then maintained body weight thereafter (weeks 4 to 16).

EFFECTS OF 3 CANINE WEIGHT LOSS FOODS ON BODY COMPOSITION AND OBESITY MARKERS

Yamka RM, Friesen KG, Frantz NZ. *Intern J Appl Res Vet Med* 2007;5:125-132.
Link to article

Abstract
Two experimental canine weight loss foods were developed and compared to a commercially available high fiber weight loss food in a 2-month weight loss study. The 2 new weight loss foods were formulated to contain increased levels of amino acids and crude protein. In addition, the 2 new weight loss foods had reduced total dietary fiber and increased soluble fiber when compared to the commercially available high fiber weight loss food. All foods were effective in reducing body weights of dogs. The foods containing increased lysine:calorie and reduced fiber enabled dogs to maintain lean muscle mass during weight loss. Thus, increasing the lysine:calorie and decreasing fiber in weight loss foods ensures that dogs lose fat predominantly during weight loss. In addition, serum levels of leptin, triglycerides, cholesterol, potassium, magnesium, sodium, and total protein were reduced during weight loss in dogs fed all 3 foods.

THE PET STUDY: PEOPLE AND PETS EXERCISING TOGETHER

Kushner RF, Blatner DJ, Jewell DJ et al. *Obesity* 2006;14:1762–1770.
Link to article

Summary

- A one-year study was conducted to compare the efficacy of weight loss programs for dogs-only and people-only groups to that of a combined dog/owner weight management program.
- The study consisted of three groups of overweight participants – a dog-only group (53 dogs), a people-only group (56 people), and a dog/owner group (35 people and their dogs).
- During the study, the overweight dogs were fed Prescription Diet Canine r/d, which is specifically formulated for weight loss.
- Once dogs reached their ideal weight, they were fed Prescription Diet Canine w/d, which is specifically formulated for weight maintenance.
- Human participants were provided with a suggested exercise plan, meal plans, pedometers, and instructions on lifestyle behavioral patterns to control dietary calories and increase physical activities.
- During the course of the 12-month study, both people and dogs lost weight and kept it off.
- People lost an average of 11 pounds (approximately 5% of their initial body weight) and dogs lost an average of 12 pounds (approximately 15.6% of their initial body weight).
- The maximum individual weight loss for people was 51 pounds and the maximum individual weight loss for dogs was 35 pounds.
- Program retention was significantly better in the dog/owner group than in the dogs-only group.
- Prescription Diet Canine r/d was effective in helping pets achieve their weight loss goals as was Prescription Diet Canine w/d in helping pets maintain their ideal weight.

IDENTIFICATION OF CANINE MARKERS RELATED TO OBESITY AND THE EFFECTS OF WEIGHT LOSS ON THE MARKERS OF INTEREST

Yamka RM, Friesen KG, and Frantz NZ. *Intern J Appl Res Vet Med* 2006;4(4):282-292.
Link to article

Abstract
Study 1 included 30 lean and 30 overweight beagles (15 each spayed female and 15 each neutered male) to determine the effect of obesity and gender on marker differences. Animals were weighed and given a body condition score (1 = lean, = ideal, and 5 = overweight), and a blood sample was drawn. Average body condition scores were 4.7 and 2.5 and average body weights were 17.3 and 11.2 kg for the overweight and lean groups, respectively. Serum was analyzed for chemistry screens, obesity markers, thyroid markers, and arthritis markers. The overweight group had higher levels of alkaline phosphatase ($P = 0.04$), cholesterol ($P = 0.04$), triglycerides ($P = 0.06$), total protein ($P < 0.01$), albumin ($P < 0.01$), thyroxine ($P = 0.05$), calcium ($P < 0.01$), phosphorous ($P = 0.04$), glucose ($P < 0.01$), insulin ($P < 0.01$), insulin-like growth factor-1 ($P < 0.01$), low density lipoprotein ($P < 0.01$), leptin ($P < 0.01$), and type II cartilage synthesis ($P < 0.01$). The overweight group had lower levels of creatinine ($P = 0.01$), serum urea nitrogen ($P < 0.01$), C-reactive protein ($P < 0.01$), and chloride ($P < 0.01$), and overweight males had lower levels of testosterone ($P = 0.04$). No other gender-specific differences were observed. The markers identified in Study 1 were then utilized in a weight loss study (Study 2) to determine the effects of weight loss on the biomarkers. Twenty dogs were fed Prescription Diet r/d dry or canned for 90 days for weight loss. At the completion of the study, all dogs lost weight ($P < 0.01$; dry -20% and can -28%). Dogs fed the canned food had a decrease in total protein ($P < 0.01$), alkaline phosphatase ($P = 0.03$), albumin ($P < 0.01$), cholesterol ($P < 0.01$), triglycerides ($P < 0.01$), leptin ($P < 0.01$), and phosphorus ($P < 0.01$), and an increase in calcium ($P = 0.02$) and chloride ($P < 0.01$). Dogs fed the dry food had a decrease in albumin ($P < 0.01$), total protein ($P < 0.01$), cholesterol ($P < 0.01$), and leptin ($P < 0.01$), and an increase in calcium ($P < 0.01$), chloride ($P < 0.01$), and serum urea nitrogen ($P = 0.03$). These data indicate that obesity is directly related to other disease states in dogs (ie, arthritis and diabetes). Managing obesity through weight loss and calorie restriction corrects the differences observed between lean and overweight blood markers.

EFFECT OF DIETARY INSOLUBLE FIBER ON CONTROL OF GLYCEMIA IN DOGS WITH NATURALLY ACQUIRED DIABETES MELLITUS

Nelson RW, Duesberg CA, Ford SL, et al. *J Am Vet Med Assoc* 1998;212:380-386.
Link to PubMed

Summary

- 11 dogs with naturally occuring diabetes mellitus were fed either a high insoluble fiber (HF) or low insoluble fiber (LF) food in a random order for 8 months for each food.
- Concentrations of glucose in serum were significantly lower for all fasting and most postprandial time points for dogs fed the HF food.
- Results of this study supports feeding dogs with a HF food at the level of Prescription Diet w/d Canine (12% cellulose) to aid in the management of glycemia in dogs with diabetes mellitus.

OTHER HILL'S AUTHORED PUBLICATIONS IN CATEGORY OF CANINE WEIGHT MANAGEMENT/FOOD INTAKE

Pateau-Robinson I, Stiers C. A non-invasive method to estimate percent body fat is as good as dexa to calculate an ideal body weight in obese dogs. *J Vet Intern Med* 2014:28;1089(#NM-12).
Link to PDF of abstract program

Witzel A, Paetau-Robinson I, Kirk C. Successful weight reduction in severely obese dogs. *J Vet Intern Med* 2014:28;1086(#NM-5).
Link to PDF of abstract program

Jewell DE, Brockman J, Huentelman MJ, et al. Lean body mass and loci containing genes involved in insulin and glucose regulation are associated with calorie intake in dogs. *The FASEB Journal* 2013 27:1_supplement, 345.3-345.3.
Link to article

Jewell DE, Greitl JL, Joshi DK, Hall JA. Effect of a medium-chain triglyceride: fish oil enriched diet on lean body mass, circulating fatty acids, and metabolites in dogs. *J Vet Intern Med* 2011;25(3):733.
Link to article

Lusby AL, Kirk CA, Bartges JW, Moyers TD, Toll PW. Prevalence of asymptomatic bacterial urinary tract infections in morbidly obese dogs. *J Vet Intern Med* 2011;25(3):717.
Link to PDF of abstract program

Lusby A, Kirk C, Toll P, Paetau-Robinson I. Effectiveness of BCS for estimation of ideal body weight and energy requirements in overweight and obese dogs compared to DXA. *J Vet Intern Med* 2010:24;717(#153).
Link to PDF of abstract program

Toll P, Paetau-Robinson I, Lusby A, Henry G, Kirk C. Effectiveness of morphometric measurements for predicting body composition in overweight and obese dogs. *J Vet Intern Med* 2010:24;717(#152).
Link to PDF of abstract program

Yamka RM, Frantz NZ, Zicker SC. Metabolomic profiling of plasma in lean vs obese dogs. *J Vet Intern Med* 2009;23(3):765(#277).
Link to PDF of all abstracts

Yamka RM, Friesen KG, Gao X, et al. Identification of genes related to obesity in dogs. *The FASEB Journal* 2007 21:5, A4.
Link to article

Yamka RM, Friesen KG, Stiers CA, et al. Using ultrasound as an alternative method for determining body fat in beagles. *J Anim Sci* 2007; 85 (Suppl.): 266.

Jewell DE, Toll PW. Canine protein requirement and circulating glucose concentration during weight loss. *The FASEB Journal* 2007 21:6, A743.
Link to article

M, Armstrong PJ, Kirk CA, et al. Prevalence and risk factors for obesity in adult dogs from private U.S. veterinary practices. *Intern J Appl Res Vet Med* 2006;4:177-186.
Link to article

Jewell DE, Toll PW, Azain MJ, et al. Fiber but not conjugated linoleic acid influences adiposity in dogs. *Vet Ther* 2006;7:78-85.
Link to PubMed

Silvio J, Harmon DL, Gross KL, et al. Influence of fiber fermentability on nutrient digestion in the dog. *Nutrition* 2000; 16: 289-295.
Link to PubMed

Jewell DE, Toll PW, Novotny BJ. Satiety reduces adiposity in dogs. *Vet Therapeutics* 2000;1:17-23.
Link to PubMed

Gross KL, Wedekind KJ, Kirk CA, et al. Effect of dietary carnitine or chromium on weight loss and body composition of obese dogs (abstract). *J Anim Sci* 1998; 76 (Suppl. 1): 175.

Borne AT, Wolfsheimier KJ, Truett AA, et al. Differential metabolic effects of energy restriction in dogs using diets varying in fat and fiber content. *Obesity Res* 1996;4:337-345.
Link to article

Jewell DE, Toll PW. Effects of fiber on food intake in dogs. *Vet Clin Nutr* 1996;3:115-118.

Lewis LD, Magerkurth JH, Roudebush P, Morris ML Jr, Mitchell EE, Teeter SM. Stool characteristics, gastrointestinal transit time and nutrient digestibility in dogs fed different fiber sources. *J Nutr* 1994;124(12 Suppl):2716S–2718S. doi:10.1093/jn/124.suppl_12.2716S.
Link to PubMed

FELINE PUBLICATIONS

BACTERIAL FECAL MICROBIOTA IS ONLY MINIMALLY AFFECTED BY A STANDARDIZED WEIGHT LOSS PLAN IN OBESE CATS

Tal M, Weese JS, Gomez DE *et al. BMC Veterinary Research* 2020;16:Article #112.
Link to Article

EFFECTIVENESS OF A NEW DIETETIC WEIGHT MANAGEMENT FOOD TO ACHIEVE WEIGHT LOSS IN CLIENT-OWNED OBESE CATS

Christmann U, Becvarova I, Werre S, Meyer H. *J Feline Med Surg* 2016;18(12):947-953.
Link to PubMed

Summary

- 83% of cats (n=132) fed Hill's Prescription Diet Metabolic lost weight with an average weight loss of 11.0% over 6 months and an average weekly weight-loss rate of 0.45%.
- BCS and BFI decreased significantly over time compared to baseline.
- 79% of cats ate more Hill's Prescription Diet Metabolic than the recommended daily energy requirement (DER) for weight loss and 83% of cats still lost weight.
- Increased energy and happiness without changes in appetite or begging behavior were perceived by the owners of the cats after weight loss.

EFFECT OF FEEDING A WEIGHT LOSS FOOD BEYOND A CALORIC RESTRICTION PERIOD ON BODY COMPOSITION AND RESISTANCE TO WEIGHT GAIN IN CATS

Floerchinger AM, Jackson MI, Jewell DE *et al. J Am Vet Med Assoc* 2015;247:365–374.
Link to PubMed

A REDUCED CALORIE, HIGH-FIBRE FOOD WITH ADDED COCONUT OIL, L-CARNITINE, LYSINE, AND LEUCINE INCREASES BASAL METABOLIC RATE IN OVERWEIGHT AND OBESE CATS

Jewell D, Floerchinger A, Jackson M *et al. J Vet Intern Med.* 2014;28(3):1088(NM-10).

Abstract

Obesity is an increasingly common health concern that is frequently linked to other serious diseases in cats. The purpose of this study was to determine the weight loss and weight maintenance benefits of a reduced calorie, high fiber test food with added coconut oil, L-carnitine, lysine, and leucine designed to support fat metabolizing pathways in overweight or obese cats.

The protocol was approved by an IACUC and participating cats were group housed for social interaction in spacious rooms with natural light. The treatment group was composed of 20 cats with a body condition score of 4 or 5/5 and >30% body fat as determined by DEXA. This group was compared to the colony average (n = 418) and a colony derived subset of 20 adiposity matched controls. The treatment group was fed to achieve about 1% body weight (BW) loss per week for 4 months, or until they achieved 15-25% body fat, followed by 4 months of feeding to maintain body weight. The colony was fed a variety of foods for maintenance of body weight throughout the study. Baseline DEXA scan data was available for all cats (n = 438). Test food fed cats were weighed weekly and DEXA scanned monthly. Ideal body weights (IBW) were calculated from baseline DEXA as 1.25*lean body mass. Energy intakes were recorded throughout and caloric intake/kg IBW was compared between groups. All study foods met minimum AAFCO requirements for adult cats.

Twenty Test food fed cats completed the weight loss phase and 19/20 completed the weight maintenance phase without complications. Cats lost approximately 1.25% BW per week during the weight loss phase.

After 4 months of maintenance feeding, DEXA revealed that the Test group had a mean percent body fat of 20.7 ± 1.7%. Compared to the beginning of the weight maintenance phase, mean lean body mass increased by 4.4% (152 ± 42 g, $p < 0.01$), mean body fat mass decreased by 21.0% (276 ± 52 g, $p \leq 0.01$), and mean body weight decreased by 2.5% (123 ± 57 g, $p = 0.04$). The treatment group consumed significantly fewer calories than the colony during months 1-6 ($p \leq 0.01$) and the adiposity matched control group during months 2-4 ($p \leq 0.01$). Interestingly, despite losing fat mass, Test food fed cats consumed 24% more calories/kg IBW on average than the colony during month 8 ($p \leq 0.01$) and 34.5% and 55% more than the adiposity matched controls in months 7 and 8 ($p \leq 0.01$), respectively.

Results support that the food in this study led to successful weight loss and maintenance. Body condition improved through loss of fat and gain of lean muscle during the weight maintenance phase. Furthermore, metabolic rate appeared to increase over time as evidenced by preservation of body weight despite increased caloric intake compared to a large control group.

LEAN BODY MASS INCREASES, BODY FAT DECREASES DURING WEIGHT MAINTENANCE FOLLOWING WEIGHT LOSS IN OBESE CATS

MacLeay JM, Hahn K, Melendez L. *J Vet Intern Med* 2013;27(3):743-744(NM-7).

Abstract
The objective of this study was to document body composition changes during weight loss followed by weight maintenance in cats fed a new food moderate in fiber, fat and protein.

Twenty domestic shorthair cats were determined to be at least 20% over their individual calculated ideal body weight as determined by dual x-ray absorptiometry (DXA). During the weight loss phase of the study, cats were offered a ration of the test food based on each individual's energy requirements set to achieve weight loss of 1-2% body weight/week. Cats were placed on the weight maintenance protocol once they achieved target body weight (15-20% of their body composition as fat) or at the end of 4 months. The weight maintenance phase lasted an additional 4 months. Food offerings were adjusted as needed to maintain the body weight achieved at the end of the weight loss period. Monthly DXA was performed to determine body composition changes during weight loss and weight maintenance. Changes in body weight, percent body fat and lean mass at each time point were compared to baseline (month 0 for weight loss phase and month 4 for weight maintenance phase) using a paired t-test.

During the weight loss phase, average body weight decreased from 6.60 ± 0.35 to 5.04 ± 0.27 kg ($P < 0.01$). Average percent body fat decreased from 40.1 ± 1.5 to 26.1 ± 1.5 ($P < 0.01$). Lean body mass decreased from 3.75 ± 0.16 to 3.54 ± 0.16 kg ($P < 0.01$). During the weight maintenance phase, average total body weight decreased slightly from 5.04 ± 0.27 to4.88 ± 0.25 kg, ($P = 0.04$). Average percent body fat decreased from 25.5 ± 1.4 to 20.7 ± 1.7 ($P < 0.01$). Average lean body mass increased from 3.55 ± 0.17 to 3.70 ± 0.17 kg ($P < 0.01$).Serum biochemistry values remained in the normal range during both weight loss and maintenance.

Based on this data, the test food provided safe and effective weight loss and maintenance. Lean body mass increased during the weight maintenance phase in the face of continued loss of body fat.

INDUCING DIETARY KETOSIS IS SAFE AND EFFECTIVE IN PROVIDING WEIGHT LOSS IN CATS

Melendez L, Schoenherr WD, Hahn KA. *J Vet Intern Med* 2010:24;773(#332).
Link to PDF of abstract program

Abstract
A prior study showed that a high protein, low carbohydrate, moderate fiber food induced ketosis in obese cats during weight loss. The objective of this study was to determine the effect dietary-induced ketosis on body composition during weight loss in obese cats.

Sixteen obese cats (body condition score > 4; 5 point scale) were randomized to be fed a dry or wet formulation of a high protein, low carbohydrate, moderate fiber food for 24 weeks. Food intake was

restricted for the duration of the experiment to cause weight loss. Daily food amount was based on ideal body weight (20% body fat) energy requirements [kcal offered per day = 0.7 x (70 x initial body weight (kg)75)]. The amount of food offered daily to each animal was calculated by dividing the amount of calories to be offered by the caloric density of the food (kcal/kg). Use of this equation was estimated to allow animals to lose body weight at a rate of 0.5 to 1.5% of their initial body weight per week. Initial body composition was determined by DEXA. Ideal body weight was estimated by calculating fat-free body mass from the DEXA analysis and adding 20% fat to this total. Both groups were compared for rate of weight loss, body compositional changes as measured by DEXA, and clinical chemistry changes every 4 weeks. The study concluded when a cat attained ideal body weight or 24 weeks.

Obese cats in both food groups had increased serum levels of β-hydroxybutyrate (BHBA) by week 8. Cats fed the wet food maintained higher levels of BHBA throughout the study. Cats fed the dry food had BHBA levels return to baseline by week 12. No other changes in clinical chemistry were observed.

The rate of weight loss did not differ between the two formulations (wet, -7.3 g/d; dry, -6.9 g/d). Most of the body weight change was related to change in body fat tissue (dry, -7.6 g/d; wet, -6.5 g/d). Cats fed the wet formulation lost very little lean tissue (-0.8 g/d; or 4% compared to baseline) during the 24 week study. Cats fed the dry formulation gained a small amount of lean tissue 0.8 g/d) during the study.

This data indicates that a low-fat, high-fiber, high-protein diet induces ketosis, provides effective weight loss, and maintains lean body mass.

EFFECT OF TOTAL DIETARY FIBER ON SATIETY IN CATS

Yamka M, Friesen K. *The FASEB Journal* 2008 22:1_supplement, 1117.2-1117.2.
Link to article

Abstract
The objective of this study was to investigate the effects of feeding two foods with elevated levels of total dietary fiber on satiety in cats. Both foods were formulated to contain similar levels of total dietary fiber (TDF; > 11.5% dry matter basis). The foods were fed to two groups of 10 cats (average age = 5.48 ± 1.54 years; average weight = 3.21 ± 0.53 kg) for a period of 16 weeks in order to determine the effect of total dietary fiber on satiety. During the study cats were given ad libitum access to the foods throughout the day. Food intake was recorded daily and body weight was recorded weekly to determine the effects of fiber on satiety and weight maintenance. During the 16 week study, body weight and intake did not change for both treatments. There were no differences between the two treatments for intake or body weight at week 1 or 16 indicating that the level of TDF in both foods was efficacious in promoting satiety in cats. The results of this study demonstrate that satiety and body weight can be controlled in cats fed ad libitum with foods containing > 11.5% total dietary fiber.

COMPARISON OF A LOW CARBOHYDRATE-LOW FIBER DIET AND A MODERATE CARBOHYDRATE-HIGH FIBER DIET IN THE MANAGEMENT OF FELINE DIABETES MELLITUS

Bennett N, Greco DS, Peterson ME, et al. *J Fel Med Surg* 2006;8:73-84.
Link to article

Summary
- 63 cats with naturally acquired diabetes mellitus were fed either a canned low carbohydrate-low fiber (LC-LF, n=31) food or a canned moderate carbohydrate-high fiber (MC-HF, n=32) food for 16 weeks.
- By 16 weeks, significantly more cats in the LC-LF (22/31) group had converted to a non-insulin dependent state than the MC-HF fed cats (13/32).
- There was no significant difference for weight change from weeks 0 to 16 between the groups.

- Diabetic cats fed the canned LC-LF food in this study were significantly more likely to revert to a non-insulin-dependent state versus cats fed the MC–HF food.

EFFECT OF DIETARY INSOLUBLE FIBER ON CONTROL OF GLYCEMIA IN CATS WITH NATURALLY ACQUIRED DIABETES MELLITUS

Nelson RW, Scott-Moncrieff JC, Feldman EC, et al. *J Am Vet Med Assoc* 2000;216:1082-1088.
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Summary

- 16 cats with naturally acquired diabetes mellitus were fed a high insoluble fiber (HF) or low insoluble fiber (LF) food in a crossover study design.
- Cats on the HF food had significantly better glycemic control than LF fed cats.
- Results of this study support feeding cats with a HF food at the level of Prescription Diet w/d Feline (12% cellulose) to aid in the management of glycemia in cats with diabetes mellitus.

EFFECTS OF LOW-FAT/HIGH-FIBER IN THE DIETARY MANAGEMENT OF OBESITY

Hand MS. Proceedings. 6th Veterinary Medical Forum (ACVIM) 1988:702-704.

Summary
The effectiveness of a low-fat, high-fiber food (Prescription Diet r/d Feline formula) in the treatment of feline obesity is summarized. Weight loss in obese cats fed a low-fat, high-fiber food was similar whether the cats were fed the food free-choice or restricted to 60% of their maintenance energy requirement (MER) at their estimated optimal weight. With this food, the free-choice fed cats limited themselves to a caloric intake of approximately 70% of their MER at optimal body weight.
Main Point
Prescription Diet r/d Feline pet food is effective in achieving weight loss in obese cats.

OTHER HILL'S AUTHORED PUBLICATIONS IN CATEGORY OF FELINE WEIGHT MANAGEMENT/FOOD INTAKE

Levine ED, Erb HN, Schoenherr B, and Houpt KA. Owner's perception of changes in behaviors associated with dieting in fat cats. *Journal of Veterinary Behavior* 2016:11;37-41.
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Witzel A, Paetau-Robinson I, Kirk C. Successful weight reduction in severely obese cats. *J Vet Intern Med* 2014:28;1086(NM-4).
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Lusby A, Kirk C, Toll P, Paetau-Robinson I, Henry GA, Hahn KA. Effectiveness of BCS for estimation of ideal body weight and energy requirements in overweight and obese cats compared to DXA. *European College of Veterinary Internal Medicine* 2010.

Melendez L, Schoenherr WD, Hahn KA. Inducing dietary ketosis is safe and effective in providing weight loss in cats. *Proc Br Small Anim Vet Assoc* 2009.

Melendez L, Schoenherr W, Hahn K. Inducing dietary ketosis is safe and effective in providing weight loss in cats. *European College of Veterinary Internal Medicine* 2009.

Melendez L, Schoenherr WD, Hahn KA. Titration of NFE in canned formulations to induce ketosis and weight loss in obese cats. *Proc Br Small Anim Vet Assoc* 2009.

Melendez L, Schoenherr W, Hahn K. Titration of NFE in canned formulations to induce ketosis and weight loss in obese cats. *European College of Veterinary Internal Medicine* 2009.

Farrell C, Fritsch D, Sixby K, Allen T, Paetau-Robinson I, Hahn K. A high-protein, low-carbohydrate, high-fiber food for cats with diabetes mellitus. *Proc Southern European Vet Conf* 2009.

Frantz NZ, Yamka RM, Friesen KG. The effect of diet and lysine:calorie ratio on body composition and kidney measures in healthy adult and geriatric cats. Intern *J Appl Res Vet Med* 2007;5(1):25-36.
Link to article

EVALUATION OF A WEIGHT MANAGEMENT FOOD DESIGNED TO INCREASE BASAL METABOLISM IN A HOME SETTING

Towell T, Forrester SD, Cross S *et al. Intern J Appl Res Vet Med* 2015;13(1):14-22.
Link to article

Abstract
Decreasing calorie intake is the principle strategy for weight loss in overweight or obese pets. Pet owner behaviors such as noncompliance and overfeeding are often cited as reasons for failure of in-home weight management programs. This study evaluated the effectiveness of a weight management food designed to increase basal metabolism of client-owned, overweight dogs (n=159, mean age 6.8 years) and cats (n=155, mean age 6.7 years) with a body condition score (BCS) ≥4 (5-point scale) in a home setting in the absence of specific instructions to change lifestyle or exercise routines to facilitate weight loss. The daily ration of the test food to achieve ideal body weight were estimated by use of a recently described morphometric measurement method and online tool. Each pet completed the study after being fed the test food for 60 days following an initial 7-day transition period. While 96% of dogs and 81% of cats lost weight by the end of the study, only 77% of dog owners and 52% of cat owners perceived that weight loss occurred in their pets. A survey of participating owners found that 77% and 59% of dog and cat owners, respectively, said the food was “an easy way for their pet to lose weight,” and 67% and 63% of dog and cat owners, respectively, said the food “kept their pets feeling full and satisfied.” This study demonstrated that providing a specific nutritional recommendation based on an accurate assessment of ideal body weight for a food designed to increase basal metabolism results in successful in home weight loss in overweight dogs and cats with minimal intervention by the veterinary health care team.

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Jamikorn UA, Harmon DL, Davenport DJ, et al. Fermentability of selected fibers by dog and cat fecal microflora (abstract). *J Anim Sci* 1999 (Suppl 1);77:191-192.

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